MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

Permitting and Compliance Division
Water Protection Bureau
P.O. Box 200901
Helena, MT 59620-0901

Statement of Basis
Montana Ground Water Pollution Control System (MGWPCS)

PERMITTEE:	Lang Creek Brewery, Inc.
PERMIT NUMBER:	MTX000088
FACILITY NAME:	Lang Creek Brewery
FACILITY LOCATION:	SE/4, SW/4 of Section 18 Township 26 North Range 26 West, Flathead County
FACILITY CONTACT:	Kelly Wilkey, Administrative Manager P.O. Box 9313 Kalispell, Montana 59904 (406)253-0936
RECEIVING WATER:	Class I, Ground Water

FEE INFORMATION

Number of Outfalls:	1 - Industrial
Type:	001 – land application 002 – subsurface drainfield

I. PERMIT STATUS

This statement of basis is for the permit renewal for Lang Creek Brewery (LCB) pursuant to the Montana Ground Water Pollution Control System (MGWPCS). The initial MGWPCS discharge permit was issued on April 1, 1994, and expired on March 31, 1999. Permit modifications were done on May 2, 1994 and August 7, 1995, to include additional sampling requirements. Correspondence from LCB dated June 11, 1996, indicated the brewery expanded their production.

On March 1, 2002, the Department sent a letter to LCB for failure to submit an application for permit renewal, as required according to ARM 17.30.1033(1). On December 2, 2003, the Department sent LCB a violation letter for failure to submit discharge monitoring reports (DMRs) as required in the existing MGWPCS Permit (Part B). On August 16, 2004, LCB submitted a MGWPCS GW-1 application for a permit renewal. The application was received by the Department on August 19, 2004, in accordance with ARM 17.30.1023(4). The application was accompanied by a check for $1,500 for the permit renewal fee. The annual fee for 2003 was received by the Department on August 23, 2004. Currently, annual fees through the 2007 billing period have been paid. The Department also received the tardy DMRs.

Regarding the August 2004 application for permit renewal, supplemental information [ARM 17.30.1023(5)] was requested in a letter to LCB dated January 18, 2005. The information and a revised MGWPCS GW-1 application were received by the Department on March 28, 2005. The MGWPCS GW-2 application form currently used for "industrial and other wastewater" discharges had not been made available by the Department at the time of this renewal. The MGWPCS application was considered to be complete [ARM 17.30.1024(1)] on April 25, 2005.

This facility is subject to the Montana Nondegradation Policy (75-5-303, MCA) and the Administrative Rules of Montana (ARM 17.30.701, et seq.). Although the land application area has been expanded, based on the information provided in the permit renewal application (GW-1), no new or increased source of pollutants is proposed [ARM 17.30.702(18)]. Therefore, a nondegradation review is not necessary for this permit renewal.

The discharge is considered to be industrial waste as defined in 75-5-103(12), MCA. This permit renewal is for the existing conventional wastewater treatment system [see ARM 17.30.715(1)(d)(i)].

II. FACILITY DESCRIPTION

A. General

LCB is located approximately 22 miles southwest of Marion, at 655 Lang Creek Road (see Attachment 1). LCB is a micro-brewery specializing in the production of English style ales. Manufacturing of ale, beer, malt liquor, nonalcoholic beer, porter and stout is categorized under standard industrial code (SIC) 2082. Ingredients for the Lang Ales are produced primarily with English style malts and an abundance of hops to create the unique flavors characteristic to this type of beer (LCB website, May 2008).

B. Wastewater Collection, Treatment, and Disposal

General processes within a brewery that will cause the quality and the quantity of the wastewater to fluctuate include, raw materials handling, wort (a liquid formed by soaking mash in hot water and then fermented to make beer) preparation, fermentation, filtration, cleaning in place (CIP), and packaging.

Wastewater discharged by LCB's industrial wastewater treatment system does not include sewage. In conjunction with the brewing industry, wastewater is composed of water and organic components [expressed as biological oxygen demand (BOD) and chemical oxygen demand (COD)], which consists of easily biodegradable compounds such as sugars, soluble starch, ethanol, and volatile fatty acids. Solids in the wastewater stream are expressed as total suspended solids (TSS) and consist of spent grains, kieselguhr (loose or porous diatomite), waste yeast and (hot) trub. The pH of the effluent is determined by the amount and type of chemicals (e.g., caustic soda, phosphoric acid, nitric acid, etc.) used in the clean in place (CIP) units. Nitrogen and phosphorous levels are mainly dependent on the raw materials and the amount of spent yeast in the effluent. Phosphorous is also associated with phosphorous containing chemicals that are used in the CIP unit/process (Driessen, March 2003; see Table 1).

At the LCB only four basic ingredients are used in the brewing process, hops, malt, yeast, and water. The spent grains and hops (solid waste) from each batch brew are contained in plastic drums or a large tank. These wastes are collected to be used as feed by local livestock producers. Weekly rinse and wash water composed of acid (MSDS on "Acid Cleaner No.6", which is a mixture of phosphoric and nitric acid) and

caustic (MSDS on "PWB", which is composed of silicate, phosphates, and surfactants) cleaning solutions are part of the waste stream (99% floor drains and 1% sinks).

LCB's process wastewater is aerobically treated to oxidize the organic compounds into carbon dioxide and water. The treatment system (liquids) consists of two 2,000-gallon concrete storage tanks with an aerator in the first tank to treat BOD levels. pH adjustment with the addition of caustic soda is also controlled in the first tank. The second tank is used as a settling tank and has an Orenco filter. From the settling tank the effluent enters a 1,000-gallon dose tank with an 800-gallon capacity. From the dose tank, the effluent is either siphoned-dosed to the subsurface drainfield in the winter months (November through February) or land applied on the ground surface in the summer months from April through October (see Attachment 2), with both outfalls ultimately discharging to the ground water.

The land application site was originally a 0.4-acre (15,710 sq. ft.) parcel of grassland at the brewery site. In the summer months, effluent is diverted 100% at the dose tank to the irrigation system for land application. According to information provided in the original application, the irrigation delivery line consists of two-inch black polyethylene (PE), (Eagle 3408, 200 psi, SIDR7, ASTM D2239) pipe/hose extending north from the main valve for approximately 130 feet before daylighting in a cut slope of an airstrip runway access. From this point, the single irrigation line extends 200 feet over the surface. This is a gravity flow irrigation system with two 100-foot lateral lines that can be moved. Sprinklers were supposed to disseminate the wastewater across the land application site. The design capacity of the system was reported to be equivalent to five doses of effluent to the land application system or the subsurface drainfield per week. In the case of land application, the weekly effluent volume of approximately 4,000 gallons would apply 2.5 inches of effluent to the application area.

At the time of drafting this permit renewal, flood irrigation was actually in practice at the site (see DEQ Inspection Report, 2008; Part III.E. of this statement of basis).

During usage of the land application site, Part A.3. of the original permit requires weekly visual inspections of the vegetation within the application area to ensure there is no evidence of damage caused by the effluent. In addition, *Land application shall not occur during periods of high-intensity rainfall or while soils are saturated, frozen, or snow covered.*

During the winter, 100% of the effluent is discharged from the dose tank to the subsurface drainfield. The drainfield consists of two 100-foot long by 3-foot wide trenches that are pressure-dosed through a siphon. The trenches are approximately 7 feet deep. No plan sheets were found in the DEQ file, however the following is a description provided by the permittee of the proposed drainfield. *Drainrock (¾-inch to 2-inch, with 1.5-inch on "the plans") will be placed in the trenches to the invert of the pipe. The lateral piping will have 3/16th-inch drill-holes. Drainrock will cover the piping and filter fabric will be placed over the rock. The remainder of the trenches will be backfilled with excavated native material that is free of rocks. The design size of the drainfield is 624 square feet.*

In Section G of the MGWPCS GW-1 application, the permittee stated that the average daily discharge is 685 gpd. The existing permit did not require metering of the effluent flow rate. Therefore, a production-based wastewater flow rate for a full year reflecting maximum production was provided by the applicant based on LCB's reported production of 1,800 barrels of beer (55,800 gallons) in a year. A "standard" conversion also provided by the applicant (GW-1 application form, 3/28/05) states that for every one (1) gallon of beer produced, there are seven (7) gallons of wastewater produced. Based on this conversion factor, there would be a total of 390,600 gallons of wastewater produced each year. Using a 6-day work

week (312 days) as indicated by the permittee, the average daily wastewater flow rate could be as much as 1,252 gpd.

However, since beer production is associated with a seasonal demand, maximum production occurs in the summer. Therefore, LCB land applies 75% (292,950 gallons) of the yearly effluent volume in the summer, and 25% (97,650 gallons) is discharged to the drainfield, in the winter [MGWPCS GW-1 application (3/28/05)]. During the winter months (7 to 8 months) when effluent is being discharged solely to the drainfield, the average daily discharge would range from 407 to 465 gpd, which is within the average daily discharge rate of 685 gpd that was provided by the applicant in the permit renewal application.

In the permit renewal, a totalizing flow meter(s) will be required to accurately measure the rate of effluent discharged in gallons per day during the winter and summer months (see Part I. Section E. "Compliance Schedule" of the permit renewal and Part XII of this Statement of Basis). Since there are two separate outfalls used at different times during the year, the location(s) of the flow meter(s) in the treatment-train will dictate the number of meters required to measure the flow year-around in gpd.

The permittee indicated on the application form (Section F) for permit renewal that no discharge or transportation of treated or untreated waste (sludge) or wastewater occurs from the LCB treatment system to another treatment works. A current operations and maintenance plan will need to be submitted to the Department as well as keeping a copy onsite, as part of the compliance schedule in the permit renewal. The plan must address the transporter and final disposition of sludge pumped from the wastewater treatment system.

III. DESCRIPTION OF DISCHARGE

A. Outfall Locations

The permit renewal re-authorizes the permittee to continue the discharge of wastewater from an aeration tank followed by a settling tank that goes to a dose tank (tank area located at North 48° 0' 17.5" latitude and West -115° 0' 6.5" longitude) and is pressure-dosed to the land application site (Outfall 001) during the summer, and to the subsurface drainfield (Outfall 002) in the winter.

- Outfall 001 is the land application site, which is located east of the brewery building and the subsurface drainfield area on property owned by LCB, and will extend no farther east than 300 feet ("buffer zone") from the Thompson River.
- Outfall 002 is the subsurface drainfield, which is located approximately 300 feet east of the brewery building.

B. Sampling Locations

The existing permit as well as the permit renewal requires the permittee to collect samples from the aeration tank and the dose tank (see Part VII, and Attachment 2 in this statement of basis for sample locations, required sample types, and frequencies).

- "Influent" is the identifier to be used in the permit renewal for the samples to be collected from the 2,000-gallon aeration tank (original permit identified as "Outfall 001").

- "Effluent"/Outfalls 001 and 002 is the identifier to be used in the permit renewal for the samples to be collected from the 1,000-gallon (800-gallon capacity) dose tank (original permit identified as "Outfall 002").

C. Effluent Characteristics

Table 1 shows typical characteristics of brewery effluent and indicative discharge standards that are generally applied for receiving surface water bodies in accordance with the European Union EU (EU Council Directive 1991) (Driessen, March 2003).

Table 1. Typical Characteristics of Brewery Effluent and Indicative Discharge Standards (Driessen, March 2003)

Parameter	Unit	Brewery Effluent Composition	EU Discharge Limits
COD	mg/L	2,000 – 6,000	125
BOD	mg/L	1,200 – 3,600	25
TSS	mg/L	200 – 1,000	35
Temperature	Degrees Centigrade	18 -40	ND
pH	su	4.5 - 12	ND
Nitrogen	mg/L	25 -80	10-15
Phosphorous	mg/L	10 – 50	1-2

ND = No Data

D. Past Monitoring Data

The original permit requires the permittee to collect monthly grab samples "as a composite of the effluent generated during the production of a single batch brew" (existing permit) from the wastewater aeration tank and the dose tank, separately. The samples have been analyzed for the following parameters BOD_5, ammonia-nitrogen, nitrate (as N), pH, and total dissolved solids (TDS). Analytical results are reported on a quarterly frequency.

The permittee has collected wastewater samples from each of the two tanks (aeration tank and the dose tank), separately since April 28, 1994. The first discharge monitoring reports (DMRs) begin with the last quarter of 2002. There have been 19 quarterly sampling events reported on DMR forms through the first quarter of 2008, which covers approximately 6 years. Therefore, the period of record (POR) shall apply only to this DMR data. A summary of this analytical data is provided in Table 2.

Table 2. Effluent Characteristics [(1)] from the Dose Tank (previously "Outfall 002") collected for the POR from October 1, 2002 to March 31, 2008 (DMR data)

Parameter	Location	Units	Previous Permit Limit	Minimum Value	Maximum Value	Average Value	Number Of Samples
Flow, Daily Average	Effluent	gpd	(3)	(2)	(2)	(2)	0
Biological Oxygen Demand (BOD_5)	Effluent	mg/L	(3)	1,284	4,060	2,626	19
Total Dissolved Solids (TDS)	Effluent	mg/L	(3)	676	3,180	1,788	19
Escherichia coli (E. coli)	Effluent	No./100ml	(3)	(2)	(2)	(2)	(2)
pH	Effluent	s.u.	(3)	4.60	5.96	5.08	19
Ammonia, as N	Effluent	mg/L	(3)	5.48	75.6	34.34	19
Nitrate, as N	Effluent	mg/L	(3)	<0.01	0.24	0.08	19

Footnotes:

(1) Conventional and nonconventional pollutants only, table does not include toxics.
(2) Data not available: no samples collected for this parameter.
(3) No limit in previous permit.

Historic concentrations of ammonia (as N) in the dose tank prior to discharge ranged from a low of 5.48 mg/L in the fourth quarter of 2002, to a high of 75.6 mg/L in the first quarter of 2004. The average ammonia (as N) concentration was 34.34 mg/L (see Table 2).

In the original permit, ammonia (as N) was one of the parameters of concern that was required to be monitored in the effluent and the ground water. In the permit renewal, Total Kjeldahl Nitrogen (TKN) will be required to be monitored in the wastewater samples and in the ground water samples collected at monitoring well MW1A. In addition to the inorganic ammonia (as N), TKN measures the organic ammonia (as N). In the permit renewal a TN calculation will be required for the wastewater/effluent from the analytical data, which adds nitrate/nitrite (as N) + TKN to arrive at a total nitrogen (TN) value.

In summary, effluent characteristics associated with LCB's wastewater indicate high total dissolved solids (TDS), BOD, organically bound nitrogen (TKN) as evidenced in previous ammonia concentrations, and potentially phosphorous, potassium, magnesium, calcium, and sodium. Several sampling events conducted in 1997 by the USEPA and DEQ detected concentrations of aluminum, chromium, copper, iron, magnesium, manganese and toluene in the dose tank samples at LCB. Detectable concentrations of several metals were also reported in samples collected from the ground water monitoring well (MW1A) during this time period.

In order to address the above anomalous detections, the permit renewal will require at least one expanded effluent sampling event be conducted within the final [fourth year (2012)] of the renewed permit. The GW-2 application form was not available at the time this permit expired, but will be required to be completely filled out for the next permit cycle renewal (see Part XI.B. of this statement of basis for the all-inclusive effluent monitoring requirements).

E. Compliance Inspection History

In the inspection report dated April 12, 1993, that was conducted by the Department, Tim Byron, the field inspector noted that the irrigation system was being used to maintain grass cover on the west end of the runway and adjacent grass-covered slopes. According to more current information provided on the GW-1 renewal application, the land application site now covers approximately 40 acres of the surrounding grasslands and hayfields. A 300-foot "buffer zone" along the Thompson River has been consistently maintained by LCB to prevent runoff from potentially entering the river (e.g., surface water). At full production capacity, the irrigation site is reportedly dosed less than once per day (MGWPCS GW-1 first application submittal prior to supplemental information and revisions (August 16, 2004) – Attachment: Campbell Micro-Brewery Addenda).

Inspections by the MDEQ-Water Protection Program that included sample collection at LCB were conducted on:

04-12-93, 05-26-94, 05-22-96, 08-07-96, 09-09-97, 10-23-97, 06-24-03, and 6-20-08.

Additional sampling events at this site included:

09-04-96 "Land Application N (nitrogen) Analysis" analyzed for Kjeldahl N,
04-22-97 "Individual Water Supply System" three (3) samples analyzed for nitrate,
09-24-97 Inspection sample (?) with Arnold Boettcher and T. Byron sample(?) analyzed for total metal and volatile organic compounds (VOCs),
10-23-97 "PW-1" Supply Well analyzed for metals (mostly dissolved) and VOCs, and
10-23-97 Product sample analyzed for total and dissolved metals

In 1994, an 85% removal of BOD was calculated from the aeration tank to the dose tank. Initially, BOD levels analyzed from the dose tank samples at LCB were within the limit of residential strength wastewater with a BOD equal to or less than 300 mg/L (2.44 of Circular DEQ 4, 2004). According to an August 7, 1996 inspection report, the average BOD removal from 5/13/94 through 3/21/96 was 52%. At the time of this application for permit renewal, a 66% removal of BOD from the aeration tank to the dose tank was calculated. According to the August 7, 1996 inspection report, "Engineering reports prepared by MWM Engineering and submitted by LCB during the permit application process predicted *90% removal of BOD and suspended solids after the first clarifier."* The March 28, 2005 (revised) MGWPCS GW-1 application states that there is a 50% removal of BOD. No limit and/or removal rate was required for BOD in the original permit.

A new aeration pump was installed in the aeration tank during the last quarter of 2005. Some sporadic reduction in BOD_5 concentrations have been observed since the new pump was installed. The new pump has not remained fully operational. A newer, larger pump is onsite and will be installed soon (Turnbull, 2008).

A compliance evaluation inspection was conducted by DEQ-WPB on June 20, 2008. The inspection report described the active land application site as flood irrigation consisting of one single location where effluent is being discharged from three holes in a stationary pipe that partially daylights in the field adjacent to the brewery. The vegetation was damaged in the area of the discharge point. Upgrades to the land application process and operation will be required in the permit renewal in the "Compliance Schedule" in Part I.E. of the permit and in Part XII of this statement of basis. In addition, treatment tanks (aeration, settling, and dose) will need to have sludge removed and appropriately hauled by a licensed

septic tank pumper and disposed of at a licensed wastewater treatment plant to be addressed in the operations and maintenance (O & M) plan as a standard operating procedure (SOP).

IV. SITE CHARACTERISTICS

A. Soil

The Glaciercreek Soil Series is found on geomorphic stream terrace type topography common to this area. The Glaciercreek Series extends from the surface down to approximately (60 inches) 5 feet below the ground surface (bgs). Soils near the surface are composed of gravelly silty loam, which change to gravelly loamy sand at 20 inches bgs. Cobbly loamy sand makes up the lower part of the soil section (32 to 60 inches bgs). Sediments described at the original drainfield trench excavation consisted of cobbly sand (DHES, 1993) and are similar to the soils and sub-soils found in the land application area. In the upper 14 inches of soil beneath the drainfield area, the percolation rate ranges from 6 to 12 inches per hour. Below 14 inches, the soil percolation rate increases to 20 inches per hour.

B. Geology

Onsite fractured bedrock occurs approximately 17 feet below ground surface (bgs) and consists of quartzite and argillite of the Precambrian Ravalli Formation (Belt) [DEQ EA, 1994]. The depth to bedrock is variable in this area due to the alluvial systems that have been associated with this area over time and the proximity to surface water. The deep confined aquifers that potentially exist in the bedrock are not applicable to the ground water discharge permit analysis at this site. Potential impacts from wastewater would affect the shallow aquifer first.

C. Hydrogeology

The facility is located on a moderately sloping hillside above the floodplain of the Thompson River. The Thompson River is north-northeast of the site and is the nearest downgradient surface water. Upslope, southwest of the brewery are several intermittent drainages that are sourced from the nearby ridges and hills and flow to the Thompson River.

The depth to shallow ground water in this area is variable. According to the literature (Wells, 1930), the depth of the shallow aquifer “associated with the flat river bottom” ranges from 25.8 to 40 feet bgs. The shallow aquifer is composed of gravel and sand.

A 40-foot deep well completed in the shallow aquifer supplies the brewery with water [initial pumping rate 7.5 gallons per minute (gpm)]. It is located west of the brewery building. The static water level was measured at 32 feet when the well was drilled and completed on January 5, 1994 (GWIC well log). The depth to shallow ground water in this well that was provided in the renewal application was 25.8 feet bgs (i.e., John and Sandy Campbell). It is important to note that the water from this well is not being sampled by the County or the Montana Public Water Supply (PWS).

In a phone conversation on 6/13/05, John Campbell, the owner confirmed the approximate 100 feet of separation between the end of the drainfield laterals and the shallow ground water monitoring well (MW1A). Mr. Campbell stated that the drainfield is on a topographic bench and the monitoring well is located down the slope in the flats.

Quarterly SWL measurement at MW1A was a condition of the original permit (Part A.4.). However, this data was not acquired or reported until the first quarter of 2005 and has only been maintained through the first quarter of 2007. Based on the eight quarterly measurements available, the average SWL in MW1A is 9.07 feet (see Table 4). As discussed in Part IV.C of this statement of basis, from these measurements high ground water is associated with the first quarter of the year (7.25 feet) and low ground water is associated with the third quarter of the year (11.25 feet). There is a difference of 4 feet in the ground water levels from high water to low water. Quarterly SWL measurements in monitoring well MW1A will also be required in the permit renewal.

There is also a spring on the property that reportedly provides water to the brewery owner's house (no location available).

D. Hydrology

The hydraulic conductivity (K) of the shallow gravel and sand aquifer has been "suggested" to be 3,154 meters/year (28.3 ft/day) according to (Wells, 1994). The estimated hydraulic conductivity from the "Typical K values for consolidated and unconsolidated aquifers" chart (Cherry, 1979) is 100 meters/day (328 ft/day) to 1,000 gpd/ft^2 (133.7 ft/day), which is on the low permeability side of a "fine to coarse gravel". The average K based on the estimates provided, is 163 ft/day.

The hydraulic gradient used by Wells (1994) in the Bauman/Schafer Model was 0.0076 ft/ft. The direction of ground water flow is reported by the permittee to be "to the east, toward the center of the valley" (GW-1 application sketch and Attachment 1). The original DEQ EA (1994) stated, "the precise direction of ground water flow has not been determined but can be assumed to flow to the southeast toward the Thompson River". The Thompson River is approximately 528 feet from the site and is the nearest downgradient surface water.

V. RECEIVING WATER

A. Water-Use Classification and Applicable Water Quality Standards

Effluent is discharged from LCB's wastewater treatment system to the shallow ground water. Applicable water quality standards for individual parameters of concern are established according to the receiving ground water classification based on specific conductivity in umhos/cm or microSiemens/cm. Since no specific conductivity data was available for the receiving ground water at LCB, specific conductivity was calculated based on total dissolved solids (TDS) data from samples collected from MW1A. MW1A is the onsite shallow ground water monitoring well located approximately 100 feet from the downgradient edge of the subsurface drainfield.

The average TDS is 260 mg/L for 18 quarterly samples collected over a POR from October 1, 2002 through March 31, 2008. Using the formula for calculating specific conductivity from TDS in the ground water (Anderson, 1993), where K is a constant of 0.65,

TDS (mg/L) divided by K = specific conductivity (μmhos/cm)
260 divided by 0.65 = 400 μmhos/cm.

Based on the above calculation, the specific conductivity is 400 μmhos/cm. This calculated specific conductivity value was used to determine the classification of the ground water at the site.

According to ARM 17.30.1006 (Classifications, Beneficial Uses and Specific Standards for Groundwaters), the receiving water for Outfall 001 and 002 is Class I ground water. Class I ground water has a specific conductivity of less than or equal to 1,000 μmhos/cm at 25 degrees Centigrade, as defined by ARM 17.30.1006(1). According to ARM 17.30.1006(1)(a), the quality of Class I ground water must be maintained so that these waters are suitable for public and private water supplies, culinary and food processing, irrigation, commercial and industrial purposes, drinking water for livestock and wildlife, with little or no treatment. Human health standards listed in DEQ Circular 7 (February 2006) apply to concentrations of dissolved substances in Class I ground water.

B. Nondegradation

Montana's nondegradation policy (75-5-303, MCA) applies to any activity of man resulting in a new or increased source which may cause degradation [ARM 17.30.705(1)]. The applicant must demonstrate that existing uses of state waters and the level of water quality necessary to protect those uses will be maintained. Compliance for permitting purposes is accomplished through a nonsignificance determination by the Department. A determination of nonsignificant changes in water quality is based on the criteria set forth in ARM 17.30.715 regarding flow volume, carcinogenic parameters, toxic parameters, nitrate and phosphorous concentrations, harmful parameters, and parameters for which there are only narrative water quality standards. Part A.1. of the original discharge permit states, *There shall be no degradation of state waters as defined by 75-5-303, MCA*. No new or increased sources have been identified by the applicant for this permit renewal.

The applicable ground water quality standards and nondegradation criteria are provided in Table 3.

Table 3. Applicable Ground Water Quality Standards with Nondegradation Criteria

Parameter, units	**DEQ Circular-7 Human Health Standards with Applicable Nondegradation Criteria**	**Beneficial Use ARM 17.30.1006(1)(a)**
Nitrate (as N), mg/L	7.5*	NA
Total Phosphorous (TP), mg/L	50 year breakthrough	NA
Escherichia Coli Bacteria	<1 organism per 100 ml	NA
Specific conductivity, μmhos/cm	NA	1,000
pH, s.u.	NA	6.5-8.5**

* See 75-5-301(4)(d)(i), MCA and ARM 17.30.715(1)(d)(i).
** The most sensitive beneficial use for Class I ground water is drinking water supply. Secondary maximum contaminant levels are established in 40 CFR 143.3.
NA = Not Applicable

C. Shallow Ground Water Monitoring Data

The background nitrate (as N) concentration used in the original permit was 1.67 mg/L based on an analysis from the relatively "deep" supply well at the brewery.

Before LCB commenced operations and before detection monitoring reports (DMRs) were instituted by the Department, the first shallow ground water sample was collected on April 28, 1994 from MW1A and had a concentration of 0.49 mg/L nitrates (as N). Since that time, DMRs usage has become a requirement of the Department. Over the period of record (POR) from October 1, 2002 through March 31, 2008, based on a total of 18 quarterly samples collected and analyzed, the average nitrate (as N) concentration in

the shallow ground water from MW1A is 0.24 mg/L (see Table 4). This data is more representative of the quality of the receiving water.

Samples collected from MW1A have been analyzed for the following potential pollutants and indicator parameters: inorganic ammonia-nitrogen, nitrates (as N), pH, and TDS. The original permit required the collection of quarterly ground water samples from MW1A (see Table 4).

Table 4. Local Shallow Ground Water Characteristics According to Samples Collected from Monitoring Well MW1A for the POR from October 1, 2002 through March 31, 2008 (DMR Data)

Parameter, units	Average Value	Minimum Value	Maximum Value	Number of Samples
Static Water Level, feet	9.07	7.25	11.25	8
Total Dissolved Solids, mg/L	260	14	331	18
pH, s.u.	7.45	6.85	7.70	18
Chloride, mg/L	2.9	2.9	2.9	1
*Escherichia Coli*Bacteria, #/100ml	NS	NS	NS	NS
Nitrate, as N, mg/L	0.24	0.01	1.25	18
Ammonia, as N, mg/L	1.05	<0.01	9.38	17
Total Phosphorous, mg/L	NS	NS	NS	NS

NS = No Sample

A review of approximately 5 ½ years of ground water monitoring analytical data collected from MW1A, shows wide variations over time in the concentrations of the sample parameters. Data reported from the first and second quarters of 2004, showed the maximum reported concentrations of nitrate (as N) were 1.25 mg/L nitrate (as N) and 9.38 mg/L ammonia (as N); as compared to 2005 and 2006, when nitrate (as N) and ammonia concentrations remained below 1.00 mg/L. These lower concentrations may have been the result of a new pump that was installed in the aeration tank possibly creating more effective treatment. Monitoring well data received in 2007 was sketchy at best with only the first and last quarters submitted to the Department and no data for the first quarter of 2008.

The above data indicate that better operation and maintenance (O & M) procedures need to be adopted and implemented on a regular basis, such as sludge removal from the tanks and cleanout of the drainfield lateral lines. Upgrades to the current land application practices need to include but not be limited to, better dispersion of the discharge across the site as well as maintaining vegetative growth. The compliance schedule in this statement of basis (Part XII.Table 11) and in the permit renewal (Part I.E. Special Conditions) will establish timeframes throughout the next permit cycle (5 years) to accomplish these improvements.

VI. GROUND WATER MIXING ZONE

No mixing zone has been requested by the permittee.

The depth to shallow ground water onsite (i.e., the first aquifer) ranges from 9 feet (average depth to water in MW1A), to 32 feet (GWIC well log) from the TOC at the LCB site. The depth to shallow ground water is influenced by the existing surface topography which consists of ancient stream terrace

deposits providing moderately sloping (2 to 8%) terrain toward the current floodplain of the Thompson River.

An accurate determination of the direction of shallow ground water flow will be a requirement in the permit renewal (see Part I. Section E. "Compliance Schedule" of the permit and Part XII. Table 11 in this statement of basis).

Shallow ground water flow maps shall be constructed (3-point analysis) to determine/demonstrate the direction of ground water flow and calculate the hydraulic gradient by measuring the SWLs in MW1A and at least two additional shallow wells nearby such as,

1. The rental house owned by Doug and Kelly Wilkey located 200 yards away and 40 feet "below" the wastewater system with a reported depth of 20 feet, and
2. The brewery's shallow ground water supply well (GWIC well log) that is reported to be 40 feet deep with a SWL of 32 feet and pumps 7.5 gpm,

SWL measurements at each of these three wells should be conducted at least quarterly so that potential seasonal fluctuations in flow and/or gradient can be determined. The top of the casing (north side) at these wells will need to be surveyed to obtain the accurate elevation of each well. If these wells are not available or not accessible for ground water measurements, at least two additional shallow monitoring wells may need to be installed during this permit renewal cycle.

VII. PROPOSED DISCHARGE LIMITS AND CONDITIONS

A. Scope and Authority

The Montana Water Quality Act states, it is unlawful to cause pollution via the discharge of sewage, industrial wastes, or other wastes into any state waters (75-5-605(1)(a), MCA). The Act requires that a discharge to state waters shall not cause a violation of water quality standards (75-5-605(1)(b), MCA). The Department provides criteria for discharges through the issuance of permits (75-5-605(2), MCA). The Act sets forth duties of the Department that shall include the following: issue, suspend, revoke, modify, or deny permits 401(1), MCA; examine information in order to issue a permit or issue a permit with conditions 401(2), MCA; and specify limitations in the permit 401(3), MCA.

The Act establishes that rules shall be adopted governing the application, authorization and issuance of permits to discharge sewage, industrial wastes or other wastes to state waters, provided the limitation of said permits will not result in pollution of any state waters. In response to 75-5-301(1) and (2), MCA, Montana water quality standards found in ARM 17.30.1001 *et seq*. define ground water use classifications for all state waters and numeric and narrative standards that protect those designated uses. New sources, as defined in ARM 17.30.702(18), are subject to Montana Nondegradation Policy (75-5-303, MCA) and regulations (ARM 17.30.701 *et. seq*).

B. Proposed Effluent Limits

ARM 17.30.1031 states that all issued MGWPCS permits must contain conditions including, but not limited to, discharge limitations, which will assure compliance with the ground water standards given due consideration to the economics of waste treatment and prevention. ARM 17.30.1005(1) states, the

standards in ARM 17.30.1006 establish the maximum allowable changes in ground water quality and are the basis for limiting discharges to ground water.

C. Nondegradation/Nonsignificance Evaluation

Based on nondegradation 75-5-301(5)(d)(i), MCA and ARM 17.30.715(1)(d)(i)] for an industrial facility discharging treated wastewater to the ground water without a mixing zone, the limit at the dose tank (i.e., at the end-of-the- pipe) must not exceed 7.5 mg/L nitrate (as N).

A demonstration based on the calculated adsorptive capacity of the soils in this area shows that phosphorous will be removed for a period of 51 years prior to discharge to any surface waters. This is greater than the 50-year breakthrough required according to ARM 17.30.715(1)(e) [see part IX.C of this statement of basis]. Therefore, additional analysis of potential phosphorous impacts to the surface water is not required.

VIII. INDUSTRIAL/HIGH STRENGTH EFFLUENT OPERATIONS AND MAINTENANCE

Domestic-residential strength subsurface wastewater treatment systems (SWTSs) are classified according to nitrogen reducing efficiency (Level 1a, 1b, and II). Industrial-high strength wastewater discharged to subsurface drainfields must meet the criteria set forth in DEQ Circular 4 (2004) in order to maintain efficient operation of the treatment and disposal system.

According to Circular DEQ 4 (2004) Section 5.4 states, *Subsurface wastewater disposal systems must be used only for residential strength wastewater. Wastewater exceeding the limits for residential strength must be pretreated to residential strength prior to discharging to DEQ-Circular 4 systems.* The maximum limits for residential strength wastewater are (DEQ Circular 4):

- BOD_5 less than or equal to 300 mg/L.
- Total suspended solids (TSS) less than or equal to 150 mg/L.
- Fats, oils, and grease less than or equal to 25 mg/L.

In order for LCB's subsurface drainfield to operate properly, the above concentrations should not be exceeded. It is dependent on the operations manager to prepare for the necessary winter wastewater treatment using the subsurface drainfield, either by increasing the efficiency of the existing treatment and disposal system and/or by adding additional pretreatment.

IX. PROPOSED WATER QUALITY-BASED EFFLUENT LIMITS

Effluent limitations (e.g., volume, strength, characteristics) must be established in permits [75-5-402(3), MCA] to control all pollutants or pollutant parameters that are or may be discharged at a level which will cause or, have reasonable potential (RP) to cause or contribute to an excursion above any state numeric or narrative water quality standard (USEPA, 1996). The permittee must comply with the Montana Numeric Water Quality Standards set forth in MDEQ Circular 7 (February 2006). According to ARM 17.30.1005(1), the standards in ARM 17.30.1006 establish the maximum allowable changes in ground water quality (outside of an approved ground water mixing zone) through the protection of beneficial uses by ground water classification. 75-5-303(2), MCA requires that the quality of high-quality water must be maintained.

Because the applicant did not request a mixing zone (GW-1 application form, Section J, 2004), ground water quality limits and nondegradation criteria will apply at the end-of-the-pipe (i.e., at the dose tank).

A. Nitrate

The LCB wastewater treatment system constitutes an existing source [ARM 17.30.1001(4)]. Class I ground water is considered high quality water and is subject to Montana's Nondegradation Policy [75-5-303, MCA]. No new or increased source of pollutants is proposed in the application for permit renewal [ARM 17.30.702(18)].

The applicable ground water quality standard is based on nondegradation, with a nitrate (as N) concentration limit of 7.5 mg/L [75-5-301(5)(d)(i), MCA and ARM 17.30.715 (1)(d)(ii)] at the end-of-the-pipe, because no mixing zone has been requested by the applicant.

Total nitrogen (TN) is the sum of nitrate + nitrite (as N) plus total Kjeldahl nitrogen (TKN). The Department assumes all of the nitrogen discharged to the drainfield in the effluent is converted to nitrate as nitrogen (DEQ, 2005). The allowable discharge concentration (WQBEL) for TN is derived from the mass balance water quality equation [ARM 17.30.517(1)(d)], which considers dilution and background concentration of the receiving water (USEPA, 2000), pursuant to discharge to the ground water with no mixing zone.

$$C_2 = \frac{C_3 (Q_1 + Q_2) - C_1 Q_1}{Q_2}$$

C_2 = 51 mg/L

C_1 = ambient ground water (background) concentration, is 0.24 mg/L
C_2 = allowable discharge concentration beneath the drainfield
C_3 = ground water concentration limit for pollutant (from DEQ Circular 7 or other appropriate water quality standard) at the end of the mixing zone (1 foot) is 7.5 mg/L
Q_1 = ground water volume is 547.46 ft^3 / day
Q_2 = maximum flow of discharge (average daily flow of system is 91.58 ft^3 / day)

The volume of ground water that will mix with the discharge (Q_1) is estimated using Darcy's equation: Q_1 = K I A. The calculated value of Q_1 is 547.46 ft^3/day for the mixing zone; assuming an aquifer K value of 163 ft/day, a gradient of 0.0076 ft/ft, and a cross sectional area of flow at the downgradient boundary of a 1-foot mixing zone (which essentially represents no mixing zone) of 441.93 ft^2.

Based on information submitted by the applicant/permittee, the estimated average daily flow from the brewery's wastewater treatment and disposal system is 685 gpd, or 91.58 ft^3/day. The discharge from the dose tank to the subsurface drainfield (Outfall 002) occurs during the winter months. The discharge from the dose tank to the land application site (Outfall 001) occurs during the summer months (mid-April through mid-October).

A nitrate (as N) reduction of approximately 7 percent is assumed to occur beneath the subsurface drainfield. The WQBEL for TN at the dose tank prior to discharge to the subsurface drainfield is calculated at 54.6 mg/L.

51 mg/L (.07) =	3.6 mg/L assumed nitrate reduction beneath the drainfield
51 mg/L + 3.6 mg/L =	54.6 mg/L maximum concentration of TN at the dose tank, prior to discharge to Outfall 001or 002.

The calculated effluent concentration of TN must not exceed 54.6 mg/L at the dose tank in order to maintain a concentration that is less than the state water quality standard of 7.5 mg/L for nitrate (as N) (Part VI). The WQBEL will be expressed as a load (lbs/day) based on the maximum daily flow of the system (estimated 685 gpd) and the calculated maximum concentration as follows:

Load limit (lbs/day) per outfall = effluent flow rate (gpd) x daily maximum concentration (mg/L) ***x*** *(8.34 x 10^{-6})*
Load limit (lbs/day) per outfall= (685 gpd) **x** (54.6 mg/L) **x** (8.34 x 10^{-6})
Load limit (lbs/day) per outfall= 0.31 lbs/day

The WQBELs for Outfall 001 are summarized in Table 5.

Wherever possible, self monitoring data collected from the effluent and/or the ground water, as reported by the permittee and submitted on Department DMR forms will be used to determine if there is a reasonable potential (RP) for an exceedance of a water quality. At LCB, effluent data collected at the dose tank and ground water samples collected at monitoring well MW1A were used to evaluate the parameters of concern for RP, specifically nitrates (as N).

Based on nearly five years (19 quarterly sampling events) of self-monitoring effluent data as reported on the DMRs, a (RP) analysis for nitrate (as N) was performed. RP was determined based on the USEPA *Technical Support Document for Water Quality based on Toxics Control (TSD) (EPA/505/2-90-001).* RP calculations utilize the maximum concentration detected by monitoring/sampling the effluent at the dose tank at LCB (see Table 2).

From the effluent analytical data, the maximum reported nitrate (as N) concentration in the effluent was 0.24 mg/L. This concentration was multiplied by a factor of 1.5 to arrive at a calculated reasonable potential limit for nitrate (as N) at this facility (see calculation, below).

The projected maximum effluent concentration is estimated using the following equation:

Projected maximum effluent concentration in mg/L (C_{RP}) = Maximum concentration in mg/L **x** 1.5

C_{RP} = maximum effluent concentration **x** 1.5
= 0.24 **x** 1.5
= 0.36 mg/L

The C_{RP} is 0.36 mg/L, which is less than the most stringent standard for nitrate (as N) in the ground water.

B. Phosphorous

Nonresidential/industrial effluent strength may vary depending on the commercial use. The average concentration of 10.6 mg/L of total phosphorus is consistent with the concentration found in residential wastewater and can be applied to nonresidential effluent (DEQ, 2005). The adsorption capacity of the soil is based on the total load of phosphorus, it is not concentration dependent. Based on this information, the estimated load from this facility is 0.06 pounds per day (lbs/day), which equals 22 lbs/yr.

Phosphorus is removed mainly through soil sorption processes, which are slow and vary based on soil composition. The total phosphorus (TP) limitations are narrative. They are imposed to ensure that the quality of the effluent meets the nondegradation limit prior to discharge into any surface water [ARM 17.30.715(1)(g)]. The effluent limits do not include a concentration limit for phosphorus because the method used to determine compliance is the 50-year breakthrough criteria [ARM 17.30.715(1)(e)]. The 50-year breakthrough nondegradation criterion is based on the amount of soil available to adsorb the phosphorus between the discharge point and the surface water using the average load of phosphorus from the wastewater source.

A phosphorous breakthrough analysis shows the breakthrough time to the nearest downgradient surface water (Thompson River) located approximately 550 feet from the drainfield is calculated at 51 years. Therefore, the discharge is considered nonsignificant degradation pursuant to the criteria of ARM 17.30.715(1)(e).

C. *E-Coli* Bacteria

The Department does not grant a mixing zone for *E-coli* bacteria because a properly sited and operated drainfield should remove most, if not all, of the pathogenic bacterial indicators within 2 to 3 feet of the drainfield's infiltrative surface (USEPA, 2002). The *E-coli* water quality standard is <1 organism per 100 ml in the ground water (DEQ Circular 7, 2/2006). Based on the following site-specific criteria, ground water monitoring for *E-coli* bacteria for this renewed permit cycle will be required at the existing ground water monitoring well (MW1A).

- The depth to shallow ground water beneath the subsurface drainfield area ranges from 7.25 feet to 11.25 feet. The drainfield trenches are 2 to 4 feet below the ground surface. During high ground water there may be as little as 3.25 feet of separation between the base of the trenches and the shallow ground water. This may not be adequate for sufficient natural treatment to occur in the soils in the unsaturated zone before discharging to the ground water.
- High BOD and total suspended solids (TSS) concentrations in the effluent discharged from the dose tank can cause plugging in the system accelerated by increased algal growth due to the high BOD.
- Considering the age of the system (1994), potential clogging and plugging of the drainfield laterals may have occurred over the years of usage. This may have reduced the efficiency of the discharge system and its effectiveness for subsurface treatment of the wastewater.

Siphon-dosing of the drainfield may minimize saturated conditions and maximize the organism die-off rate in the natural sediments. The subsurface drainfield discharges effluent approximately 2 to 4 feet below the ground surface. Depending on the seasonal depth to shallow ground water in this area, treatment will occur naturally in the soil-subsoils in the unsaturated zone. Therefore, quarterly sampling for *E-coli* bacteria from monitoring well MW1A will be required in the permit renewal.

In the event an *E-coli* bacteria concentration is detected above the water quality standard (less than 1 organism per 100 ml) in the ground water monitoring well (MW1A) located approximately 100 feet from the downgradient side of the drainfield, the exceedance shall be verified by timely (72-hour) re-sampling. A validated *E-coli* exceedance confirming the presence of *E-coli* bacteria in the ground water will require corrective action (see Part XI.C. of this statement of basis and Part I.D.2.) at least one additional monitoring well to be drilled. This well(s) must be drilled and completed at the hydraulically downgradient edge of the drainfield from which the bacterial release had occurred (i.e., the impacted

ground water monitoring well). Disinfection may be required to be added to the wastewater treatment system.

D. 5-Day Biological Oxygen Demand (BOD_5) and Total Suspended Solids (TSS)

With conventional wastewater treatment systems, most settleable and floatable solids are removed in the septic tank(s) during pretreatment. At LCB a 2,000-gallon settling tank with an Orenco filter follows the aeration tank, prior to the effluent entering the dose tank. A properly operated and maintained domestic septic tank/settling tank-drainfield system is expected to remove in excess of 95% of the biological material. Most particulate BOD remaining is effectively removed at the infiltrative surface and biomat. Colloidal and dissolved BOD that might pass through the biomat is removed through aerobic biological processes in the vadose zone, especially when uniform dosing and reoxygenation occur.

If excessive concentrations of BOD and TSS migrate beyond the septic tank because of poor maintenance and/or high strength wastes without sufficient pretreatment, the infiltrative surface can clog and surface seepage of wastewater or plumbing backup can occur (EPA, 2002 and DEQ Circular 4). BOD_5 and TSS are monitored for wastewater treatment system efficiency and monitoring will be required to ensure effective removal and proper maintenance is occurring.

BOD and TSS are not subject to nondegradation unless they have a reasonable potential to affect a beneficial use. The significance criteria for BOD and TSS are narrative [ARM 17.30.715 (1)(g)]. Part VIII of this statement of basis discusses the application of DEQ Circular 4 (2004) limits for high strength wastewater that is discharged to the subsurface. Regularly scheduled operation and maintenance of the existing system must be implemented. This includes but is not limited to the removal of sludge in the bottom of the tanks (aeration, settling and dose tanks). Clean and/or replace the Orenco filter(s) and all other system filters on a regular basis. Clean-out the PVC lines to the drainfield and the land application area. If these pipes are clogged, it will not allow the effluent to be distributed evenly. This wastewater treatment system may require additional pretreatment and/or upgrades to the system to more effectively treat the high strength (industrial) wastewater associated with LCB's beer production.

E. pH

Parameters of concern in the ground water for which numeric (concentration-based) human health standards are not listed in DEQ Circular 7, but that render the waters harmful, detrimental or injurious to the beneficial uses listed for Class I water [ARM 17.30.1006(1)(a)(i)] include nutrients, biological agents, and those parameters that cause taste and/or odor effects or physical effects. Narrative standards according to ARM 17.30.715(1)(g) are applicable to pH.

The most sensitive beneficial use for Class I ground water is drinking water supply [ARM 17.30.1006(1)(a)(i)]. In 40 CFR 143.3, secondary maximum contaminant levels (SMCLs) have been established as "reasonable goals for drinking water quality". The SMCL for pH ranges from 6.5 to 8.5 s.u. The Department has determined that the discharge of effluent when no ground water mixing zone has been requested must not exceed the SMCLs and the potential for beneficial uses.

The water quality standard applicable to the effluent limit for total nitrogen (TN) and the SMCL for pH, without a mixing zone are set forth in Table 5. Maximum limits for efficient operation of a subsurface drainfield disposal system for BOD, TSS, and oil and grease appear in DEQ Circular 4 (see additional explanation in Section IV.A. of this SOB).

Table 5. Water Quality-Based Effluent Limits Outfall 001 (land application) and 002 (dose tank)

Parameter, units	Daily Maximum [(1)] Concentration	90-Day Average Load[(1)] (pounds per day)[(2)]
Nitrate (as N), mg/L	7.5	0.31
E Coli Bacteria, organisms/100 ml	Less than 1	NA
Total Phosphorous (TP), mg/L	NA	0.06
pH, s.u.	6.5 to 8.5	NA

(1) See definitions, Part V of the permit
(2) Average daily load calculation: lb/da = flow (gpd) x WQBEL concentration (mg/L) x 8.34 $x10^{-6}$
NA = Not Applicable

X. PROPOSED FINAL EFFLUENT LIMIT(S)

The proposed effluent limitations for Outfall 001 and 002 are summarized in Table 6 and are based on the more restrictive of the water quality and nondegradation significance water quality criteria discussed in previous sections. The final proposed effluent limit for nitrate (as N) is nondegradation-based and exemplary of a treatment system used "for nitrate sources other than domestic sewage" as specified in ARM 17.30.715(1)(d)(i).

Table 6. Numeric Effluent Limits for Outfall 001 and 002 (at the dose tank)

Parameter, units	Daily Maximum [(1)] Concentration	90-Day Average Load[(1)] (pounds per day)[(2)]
Nitrate (as N), mg/L	7.5	0.04[(2)]
E Coli Bacteria, organisms/100 ml	Less than 1	NA
Total Phosphorous (TP), mg/L	NA	0.06
Specific Conductivity, umhos/cm	1,000	NA

(1) See definitions, Part V of the permit
(2) Average daily load calculation: lb/d = Nondegradation WQ Standard concentration (mg/L) x flow (gpd) x 8.34 x 10^{-6}
NA = Not Applicable

Other Discharge Limitations:

The average daily flow of effluent discharged to Outfall 001 or 002 (total) shall not exceed 685 gpd.

XI. MONITORING REQUIREMENTS

A. Influent Monitoring

The permittee will be required to monitor the influent for the constituents in Table 7, at the frequency and with the type of measurement indicated. Samples or measurements shall be representative of the volume and nature of the monitored waste stream. Influent sampling/monitoring shall be conducted on the influent collected from the first 2,000-gallon septic tank that serves as the aeration tank (LCB01) prior to entering the second 2,000-gallon septic tank that is used as the settling tank. Samples collected from the aeration tank should be most representative of the raw influent at this facility and will be considered the first point of control for this treatment system.

Table 7. Parameters to be Monitored in the Influent (LCB01)

Parameter, units	Frequency	Sample Type[(1)]
Nitrate (as N), mg/L	Quarterly	Composite
Total Kjeldahl Nitrogen, as N (TKN), mg/L	Quarterly	Composite
BOD_5 mg/L	Quarterly	Composite
Total Suspended Solids (TSS), mg/L	Quarterly	Composite
Total Nitrogen (TN), mg/L	Quarterly	Calculated[(2)]

(1) See definitions, Part V of the permit.
(2) Total Nitrogen (TN) is the sum of nitrate + nitrite (as N) and total Kjeldahl nitrogen (as N)

Based on the influent and the effluent analytical data, a percent removal can be calculated for the parameters in Table 7 using the following equation,

$$\frac{\text{Influent Concentration} - \text{Effluent Concentration}}{\text{Influent Concentration}} \times 100 = \%\ \text{removal}$$

To ensure adequate treatment of high strength waste and prevent clogging, treatment must remove at least 85% of BOD_5 and TSS from the raw influent. The nondegradation concentration-based limit for nitrate (as N) is proposed to ensure the system, particularly the dose tank and the subsurface drainfield are properly operated and maintained and capable of providing a 60 percent nitrogen removal rate prior to discharging effluent to the ground water.

B. Effluent Monitoring

Effluent monitoring is essential to ensure the effective treatment and consistency of the wastewater discharged from the facility. The effluent limits are established to protect the ground water from a change in water quality that would cause degradation [ARM 17.30.715] or cause a change in beneficial use [ARM 17.30.1005(1)]. Samples or measurements shall be representative of the volume and nature of the monitored discharge.

Effluent monitoring/sampling shall be conducted by collecting a composite sample from the wastewater treatment system dose tank that is representative of the discharge prior to discharging to the subsurface drainfield (Outfall 002) or the land application site (Outfall 001). Dose tank samples shall be submitted to the laboratory for analysis of all of the parameters in Table 8.

The original permit did not require effluent flow measurement. The permit renewal will require the installation of a continuous totalizing flow meter that is capable of recording total monthly flow and peak daily flow in gallons per day (gpd). This meter shall be located at the discharge point of the dose tank. Accurate records must be kept by LCB identifying where the process wastewater is being discharged, either to the drainfield or the land application site. Regular calibration of the selected flow meter according to the manufacture's specifications will also be a requirement in the permit renewal.

The permittee shall monitor the effluent (from the dose tank) for the parameters in Table 8 and at the frequency and with the type of measurement indicated. Samples or measurements shall be representative of the volume and nature of the monitored discharge. If no discharge occurs during the entire monitoring period, it shall be stated on the appropriate Discharge Monitoring Report (DMR) that no discharge occurred.

Table 8. Outfall 001 and 002 Parameters Monitored in the Effluent at the Dose Tank prior to discharge to the Land Application Site or the Subsurface Drainfield

Parameter, units	Frequency	Sample Type(1)
Effluent Flow Rate, gpd	Continuous	Continuous
Biological Oxygen Demand (BOD_5), mg/L	Quarterly	Composite
Total Kjeldahl Nitrogen (TKN), mg/L	Quarterly	Composite
Nitrate (as N), mg/L	Quarterly	Composite
Total Suspended Solids (TSS), mg/L	Quarterly	Composite
pH, s.u.	Quarterly	Grab
Total Phosphorous (TP), mg/L	Quarterly	Composite
Total Phosphorous (TP), lb/d	Quarterly	Calculated
Fats, Oils, and Grease, mg/L	Quarterly	Grab
E-Coli Bacteria, organisms/100 mL	Quarterly	Grab
Total Nitrogen (as N), mg/L	Quarterly	Calculated(2)
Total Nitrogen (as N), lb/d	Quarterly	Calculated

(1) See definitions, Part V of the permit
(2) Total Nitrogen (TN) is the sum of nitrate + nitrite (as N) and total Kjeldahl nitrogen (as N).

The 90-day average load for TN is the sum of the calculated loads for each TN sample collected within the 90-day period, divided by that number of samples.

Additional Expanded Sampling Requirements:

The permit renewal will require at least one expanded effluent sampling event be conducted within the final year of the renewed permit. Effluent samples shall be collected from the dose tank and analyzed for the parameters set forth in Section N of the GW-2 "Industrial & Other Wastewater" permit application according to the "Instructions" attached to the application form. "Conventional" Pollutants/Parameters group and Pollutant/Parameter groups, particularly the "Metals" list including aluminum, manganese, and magnesium shall also be analyzed (for additional explanation see Part XII, Table 11 – Compliance Schedule of this statement of basis).

C. Ground Water Monitoring

Ground water monitoring will be required in this permit renewal to ensure wastewater treatment efficiency and that effective removal of the parameters of concern is achieved prior to discharging to the shallow aquifer. Shallow ground water monitoring is based on the following site-specific criteria:

- Coarse subsurface soils.
- The average depth to shallow ground water at MW1A is 9 feet from the TOC.
- The shallow aquifer is used for domestic supply/drinking water at this site as well as in the beer making process.
- Lack of advanced effective high strength wastewater treatment.
- To determine potential impacts to the shallow ground water due to the limited wastewater treatment.

- The Thompson River is approximately 528 feet from the site and is considered to be a gaining stream in the vicinity of the brewery land application area.
- To ensure that existing and future beneficial uses are protected.

The permittee is required to monitor the ground water quality using the existing ground water monitoring well (MW1A) that is located approximately 100 feet from the edge (east-southeast) of the subsurface drainfield. MW1A is a shallow monitoring well completion with 5 feet of slotted 2-inch PVC pipe to a total depth of approximately 11.1 feet (Lipp, 1994). The Department has approved this well location and completion for shallow ground water quality monitoring purposesrelated to Outfall 001 and 002, until such time when the direction of shallow ground water flow at the site is better defined (see Part XII Table 11 of this statement of basis. The parameters to be monitored are listed in Table 9. A static water level measurement prior to each monitoring well sample collection will be required at MW1A. The sampling frequency/reporting period for the constituents required to be monitored is given in Table 9, as quarterly.

Table 9. Ground Water Monitoring Parameters for Monitoring Well MW1A

Parameter, units	**Frequency**	**Sample Type(1)**
Static Water Level (SWL) (feet below top of casing)	Quarterly	Instantaneous
pH, s.u.	Quarterly	Grab
E-Coli Bacteria, organisms/100 mL	Quarterly	Grab
Chloride, mg/L	Quarterly	Grab
Total Ammonia (as N), mg/L	Quarterly	Grab
Nitrate (as N), mg/L	Quarterly	Grab
Total Phosphorous (TP), mg/L	Quarterly	Grab
Specific Conductivity, µmhos/cm	Quarterly	Grab

(1) See definitions, Part I.A of the permit.

According to condition A.2 in the existing permit, samples collected from the ground water monitoring well (MW1A) were originally required to be analyzed for chloride. However, modifications to the permit eliminated chloride from the ground water monitoring well sample analysis requirements. Condition A.4 required the measurement of the static water level (SWL) in MW1A on a quarterly frequency. The permit renewal will require that quarterly sample analysis for chloride and quarterly SWL measurements from MW1A be reported.

The monitoring of chloride and specific conductance is used as indicators of potential impacts from the wastewater to the ground water.

D. Corrective Action – Water Quality Standards

The water quality standards for monitoring well MW1A are listed in Table 10. An exceedance of a water quality standard in monitoring well MW1A demonstrates that the water quality standard for nitrate (as N) and/or *E-Coli* Bacteria is exceeded at the hydraulically downgradient boundary of the subsurface drainfield since there has been no ground water mixing zone requested.

Table 10. Water Quality Standards for Monitoring Well MW1A

Parameter, units	Water Quality Standards
Nitrate (as N), mg/L	7.5
E-Coli Bacteria, organisms/100ml	Less than 1
pH, s.u.	From 6.5 to 8.5(1)
Specific Conductance, umhos/cm	Less than or equal to 1,000(2)

(1) Secondary Maximum Contaminant Level (see Part IX.E. of this SOB and 40 CFR 143.3
(2) Class I ground water beneficial uses [ARM 17.30.1006(1)(a)].

Should water quality standards be exceeded as a result of the permitted discharge at Outfall 001/002, ground water monitoring well MW1A will be required to be re-sampled within 72 hours of the laboratory notification of the analytical results from the scheduled sampling event.

Corrective action will need to be implemented should the analytical results from the resample verify the exceedance(s). Corrective action could potentially involve one or more of the following measures based on the nature and extent of the impact(s).

- Identification of the probable cause and extent of the contamination and the ground water quality changes.
- Installation of additional ground water monitoring wells, including a shallow upgradient well to be used specifically for monitoring.
- Increased sampling (frequency and/or constituents).
- Increase the efficiency of the wastewater treatment system.
- Reduce the amount of nutrients or other parameters discharged to the ground water.
- Additional treatment of the effluent prior to discharge. If E-coli bacteria are present, add disinfection.
- Discontinue flow of wastewater to the wastewater system until the cause of the impact(s) have been determined and corrected.
- Supply drinking water to hydraulically downgradient residences and/or those shallow aquifer drinking water users within a ¼-mile radius of the site.

E. Special Conditions for Land Application

Land application of treated wastewater under the current flood irrigation type system must be applied such that,

- There is no clogging/fouling of the surface and near surface soils [i.e., applied at such rates (agronomic)] that are conducive to the percolation and infiltration of the natural permeability of the soils.

- No ponding of water applied or precipitation on the surface.

- Create no surface runoff.

- No cold weather application.

- No odor.
- No overloading of nutrients to soils and/or ground water.
- Vegetation within the application area must not show signs of stress, damage, or death.

These requirements are enumerated in Part I. Section E. “Special Conditions” of the permit renewal.

XII. COMPLIANCE SCHEDULE

A compliance schedule will be included in the permit (see Table 11 of this statement of basis) to allow a reasonable opportunity for the permittee to attain compliance with the requirements issued and/or revised in the permit renewal, and lead the permittee into compliance with the Water Quality Act and the Administrative Rules of Montana (ARM 17.30.1350). Compliance must be achieved as soon as possible, but no later than the scheduled dates of compliance and interim dates for progress reports. The permittee must notify the Department in writing no later than 14 days following each interim date with a progress report and a comprehensive final report no later than 14 days from the final date of compliance.

Table 11. Compliance Schedule

Compliance Deadline Date (from Issuance of the Permit Renewal)	Applicable Citation (Law/Rule)	Action Required to Come Into Compliance
Immediately	ARM 17.30.1023(5)(a) "local hydrogeology"	Begin measuring ground water levels quarterly in the two (2) nearby shallow ground water wells (Doug & Kelly Wilkey's rental house and the shallow brewery's water supply well), in addition to quarterly ground water level measurement required in the existing monitoring well (MW1A).
90 days	75-5-602, MCA "monitoring equipment"	Install an effluent totalizing flow meter and provide the 90-day average flow rate in gpd as required on a quarterly frequency. Each quarter, report the 90-day average flow rate (gpd) and the effluent discharge point/location (i.e., subsurface drainfield, or land application site). Submit a report detailing the location and type of flow meter installed, include meter calibration timeframes.
180 days	75-5-402(2), MCA 75-5-103(28), MCA "Performance standard"	Repair/replace/upgrade the aerator, consider a longer settling time in the settling tank, and re-evaluate and upgrade the primary treatment system to reduce BOD levels in the effluent being discharged at the dose tank. Land application shall be applied at agronomic rates over the entire designated LA area (see Part XI.E of this SOB), maintaining the 300-foot buffer area from the river. Submit a report with the specifications and changes made to the treatment system and the land application operation and site. Provide a current operation and maintenance (O & M) plan, particularly regarding tank sludge removal, transportation and final disposition of the sludge
1 year	75-5-402(2), MCA 75-5-103(28), MCA "Performance standard"	Clean out, repair or replace and update the subsurface drainfield, as needed to maintain efficient subsurface discharge. Include these procedures in the (above) O & M plan. Submit a report of the upgrades to the drainfield area.
4 years	ARM 17.30.1023(4)(e) & (5)(a) "location . . . . springs"	Survey the elevations of the two (2) nearby shallow wells and MW1A. Use the quarterly static water level (SWL) measurements that LCB has been measuring (according to the first compliance item) from all three (3) shallow wells to calculate the ground water elevations for each of the three wells. Construct ground water flow maps that demonstrate the accurate shallow ground water flow direction(s) and any seasonal variations occurring at the site.
4 years	75-5-602(2), MCA "Provide Reports"	Submit the final hydrogeological report with ground water flow maps.
4.25 years	75-5-602(2), MCA "Provide Reports"	Collect a representative sample of the effluent for the expanded analyses required in Section N of the GW-2 (see Part XI.B. of this statement of basis and Part I.E. of the permit).

X. NONDEGRADATION SIGNIFICANCE DETERMINATION

The Department has determined the existing discharge is nonsignificant and there will be no degradation of state waters [Montana Nondegradation Policy (75-5-303, MCA; ARM 17.30.702(16)]. The applicable water quality standards for Class I ground water are summarized in Table 2. The effluent limits for TN and TP are based on compliance with water quality standards. The proposed discharge will not exceed the water quality standard for nitrate (as N) of 7.5 mg/L at the hydraulically downgradient boundary of the outfalls (001 and/or 002).

XI. INFORMATION SOURCES

In the development of the effluent limitations, monitoring requirements and special conditions for the draft permit, the following information sources were used to establish the basis of the draft permit and are hereby referenced:

Anderson, Keith E., *Groundwater Handbook*, National Ground Water Association, 1993, p.279.

ARM Title 17, Chapter 30, Sub-chapter 5 - Mixing Zones in Surface and Ground Water, September 1999.

ARM Title 17, Chapter 30, Sub-chapter 7 - Nondegradation of Water Quality, March 2000.

ARM Title 17, Chapter 30, Sub-chapter 10 - Montana Ground Water Pollution Control System (MGWPCS), March 2002.

Campbell, John, telephone conversation on 6/13/05.

Cherry, J.A. and Freeze, R. A., 1979, *Groundwater*. Prentice-Hall Inc., Englewood Cliffs, N.J. Chapter 2, pages 26-29

Code of Federal Regulations

DEQ Circular 7 – Montana Numeric Water Quality Standards, February 2006

DEQ, Circular 2

DEQ, Circular 4, 2004

DEQ, Environmental Assessment (EA), 1994

DEQ, "How to Perform a Nondegradation Analysis for Subsurface Wastewater Treatment Systems (SWTS)", March 2005.

DEQ Inspection Reports, 4/12/93, 5/21/96, 8/7/96, 10/23/97, 6/24/03, 6/20/08

DEQ, Memo-Regensberger, "Revised Modification of Phosphorous Concentrations for Domestic Sewage in Nondegradation Reviews, October 29, 1998

DEQ, Nitrate Sensitivity Analysis Input Data, September 1, 1994

Driessen, W. and Vereijken, T., "Recent Developments in Biological Treatment of Brewery Effluent," The Institute and Guild of Brewing Convention, Livingstone, Zambia, March 2-7, 2003

European Union (EU), http://ec.europa.eu

Lang Creek Brewery website, http://langcreekbrewery.com on 5/20/2008.

Lipp, Jerry, Ground Water Monitoring Well specifications for MW1A environmental consultant correspondence, June 23, 1994.

MDHES, "Draft EA for LCB Application for MGWPCS Permit #0088", February 18, 1994

Turnbull, Bradley, telephone conversation, May 20, 2008.

US Environmental Protection Agency, 2002. Design Manual: Onsite Wastewater Treatment and Disposal System. EPA 625/R-00/008, p. 3-29 (Table 3-19)

US EPA, "Process Design Manual-Land Treatment of Municipal Wastewater," (EPA 625/1-81-013), October 1981

US Environmental Protection Agency, U.S. EPA NPDES Permit Writers' Course, Helena, Montana September, 2000, Workbook EPA 833-B-97-001, December 1996.

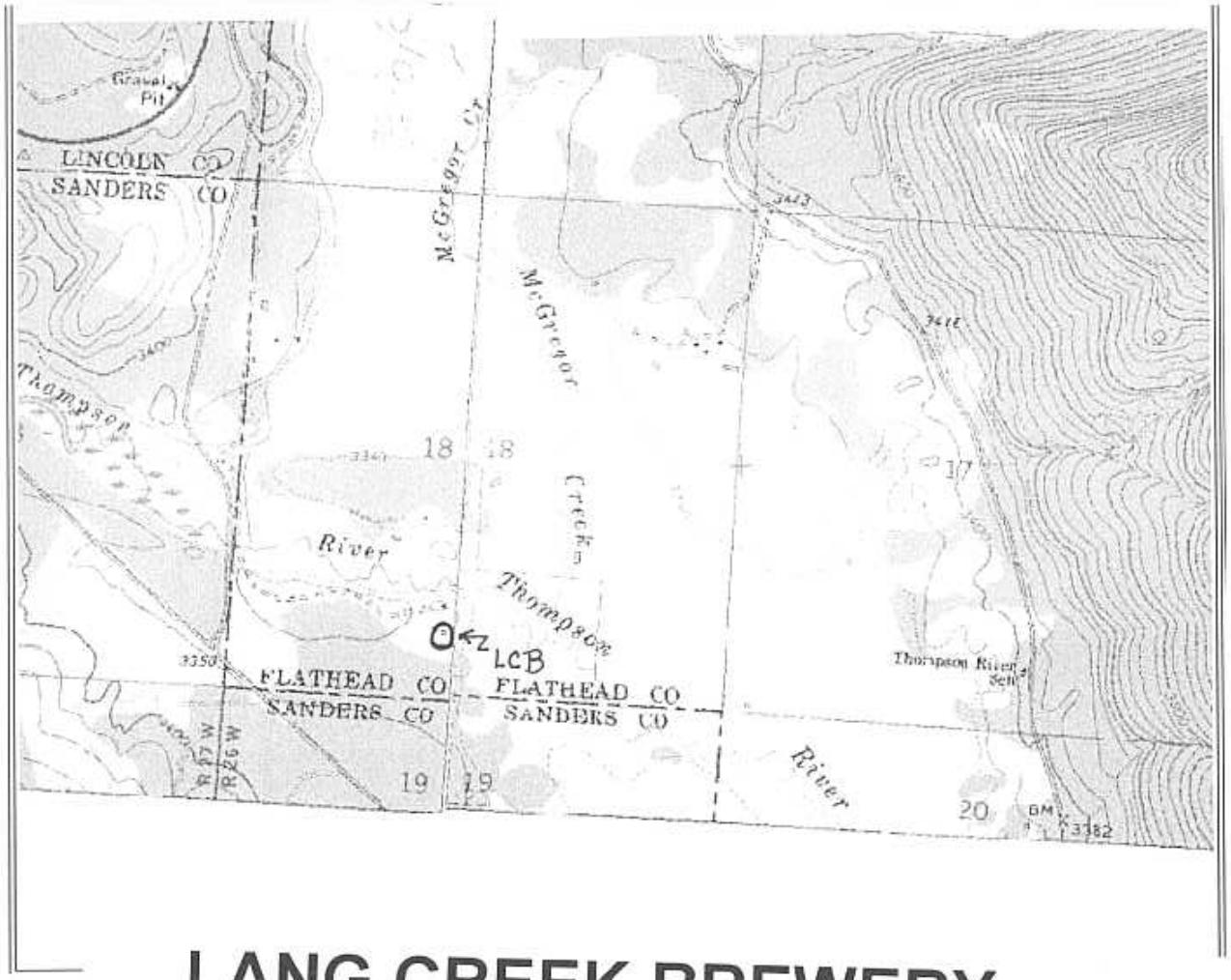
USEPA, "Technical Support Document for Water Quality based on Toxics Control (TSD)", (EPA/505/2-90-001).

Wells, Paul, WMW Engineering, correspondence to DEQ, November 30, 1994

XII. ATTACHMENTS

1. Topographic Map
2. Flow Line Diagram

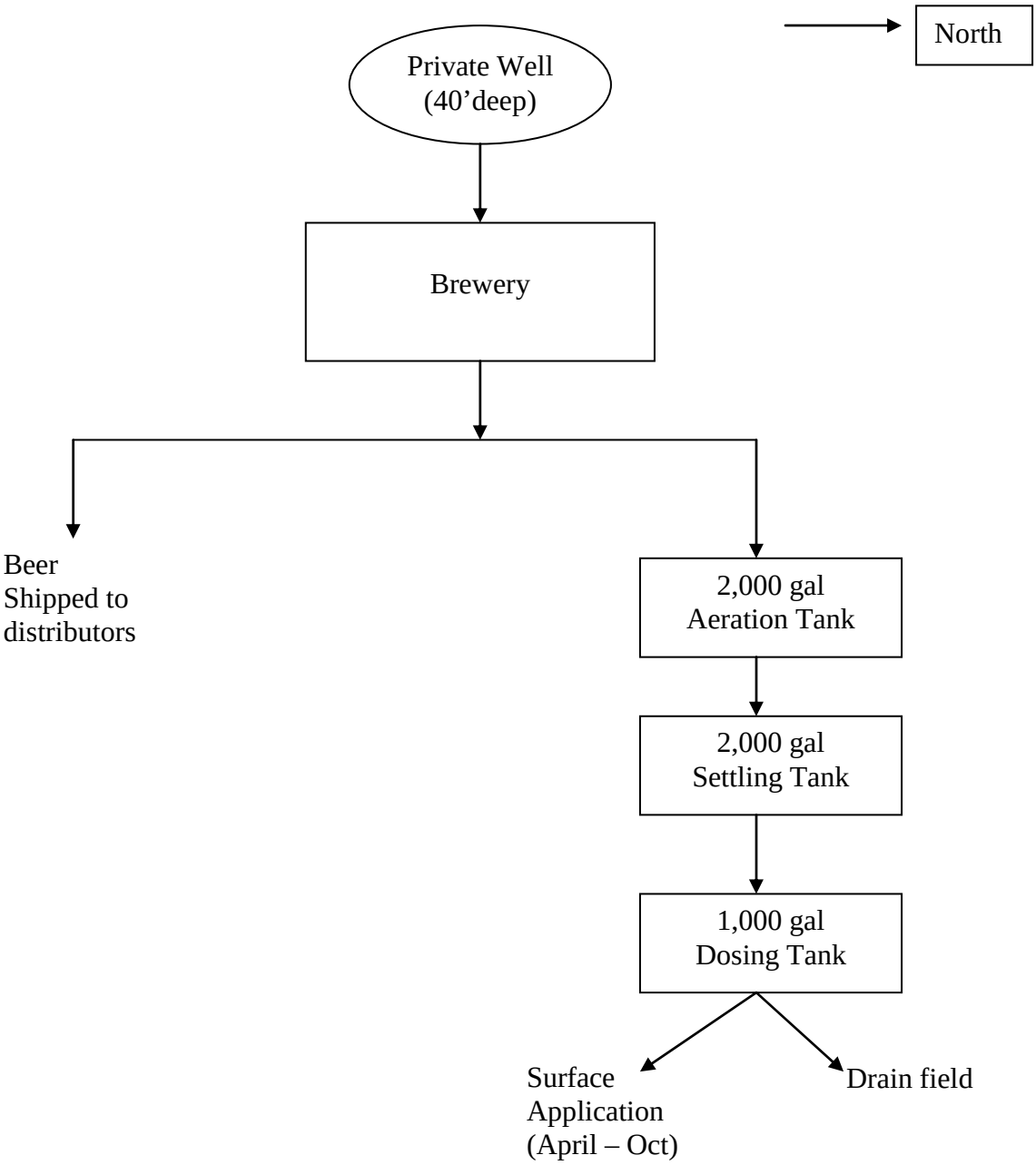
Prepared by: Pat Potts **Date:** October 3, 2008



LANG CREEK BREWERY

ATTACHMENT 1

Lang Creek Brewery 2008
Marion, Montana



Monitoring Well
200 yards away
20' below

Attachment 2